

# THE JOHNS HOPKINS UNIVERSITY

BALTIMORE, MARYLAND 21218

DEPARTMENT OF BIOLOGY

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Dr. Robert Esbjornson, Chairman  
Nobel Conference  
Gustavus Adolphus College  
St. Peter, Minnesota 56082

Dear Dr. Esbjornson:

Thank you for the material you sent relating to the general structure of the Nineteenth Annual Nobel Conference in October. Your outline of the purposes of the Conference will be very helpful in constructing a suitable presentation, and I especially appreciate the preliminary reflections that you sent. You pose many challenging questions and we speakers will have a difficult time in trying to answer them, even in a partial way.

The overall title of the Conference "Manipulating Life: Medical Advances and Human Responsibilities" evokes both short term and long term considerations. In the short term, things appear manageable, and occasionally even amusing. We read about giant mice, for example, that have been produced by the injection of the gene for mouse growth hormone into mouse eggs with subsequent in utero development. The next step of course will be a set of similar experiments on cattle, sheep and other animals of interest to man in his agricultural moments. We all know of the exciting developments over the past year or two in the cloning of bacteria for the production of human hormones, such as insulin and growth hormone, and interferon. There will undoubtedly be a continuing flow of such useful materials and the health of mankind should be improved.

A long term consideration of the Conference title is, I find, somewhat more difficult to grapple with. One becomes concerned about the long range consequences of biomedical research. Will our management of the responsibilities that should evolve from new discoveries be adequate to prevent severe sociological disintegration. The production of giant mice or giant cattle is perhaps supportable, but the production of modified human beings is another matter. We are on the verge of playing a major part in our own evolution and have reached a point in biomedical research where our capacity to control the results of the process is unpredictable.

In your preliminary reflections you present the concept of limits that we cannot or should not violate. I have a strong conviction that control of the direction or intensity of scientific investigation, medical or otherwise, is extremely difficult. An investigator who is worth his salt will attack an interesting problem for its own sake, and generally without any particular consideration of the consequences of success. I am sure that Enrico Fermi, when he discovered the consequences of slow neutron bombardment of atoms, or Otto Hahn, when he studied the fission of heavy atoms, did not for a moment think ahead to the Hiroshima bomb, or for that matter to the difficulties that sooner or later may present themselves in connection with nuclear power. As long as there are medical advances to be made and diseases to cure or alleviate, research workers in the biomedical field will continue to explore the promising leads. I was particularly taken by the thought

put forward by Lewis Thomas concerning the current possibility of a human society essentially free of disease. Because of the nature of science and scientists, research directed at the achievement of such a medically utopian state will undoubtedly continue in an inexorable (and scientifically wonderful) way, not only through the use of the newer methodologies for manipulating and modulating life, but also through the more classical techniques of synthesis and testing of classes of drugs. However, the concept of a world nearly free of disease, considered in the context of our current sociological inadequacies, is frightening. The uninhibited increase in the population of the world and the almost inevitable increase in hunger and crowding are the real problems. It is unfortunate, therefore, that the study of the modulation of human behavior and of the rate of human multiplication are not subjects with the level of popularity enjoyed by biomedical science and the curing of the sick.

I have, over the past few years, been involved to some extent with trying to set up relationships between academic institutions and industry, with particular emphasis on biotechnology. In this field the first thing that is thought of is the bioengineering of bacteria to produce goodies like interferon. Surprisingly little effort or money are spent on using the new biotechnology in areas of food production and population control. We tend to forget that the number of sick people in the world is really rather small when compared with the number of relatively healthy people who go to bed hungry every night. For this reason, I have personally advocated, whenever I could, a greater attention to the application of biotechnology to our food sources. The subject does not have the crowd appeal of cancer cures or even giant mice, but perhaps the manipulating of plant life rather than human life might ultimately prove to be the most significant direction for research to take.

Let me return for a moment to my central theme - the misuse or overuse of scientific discovery. Scientists are motivated, generally, by 1) intellectual interest; 2) the thought of making a living in a pleasant profession; 3) the desire for satisfaction of personal ambitions and the need for accolades; and 4) societal forces most frequently stemming from military and economic pressures. I maintain that we will find it impossible to legislate against scientific research of any particular sort by simply admonishing or lecturing to people who have no real desire to listen. It appears to me that only political, economic and occasionally ethnic or religious pressures can force large scale changes in behavior patterns. It is possible that the physical, mental and psychological makeup of the human animal is such that there will be no solution to this dilemma of how to preserve the human species in the backwash of his own inventions. One factor that might help is the control of population and, if possible, diminution to a much smaller level than now exists on the surface of the earth. Since it would be preferable to achieve a greatly diminished population by some means other than systematic nuclear bomb dropping, an international effort to educate the people of the world in the direction of a negative population rate should be a first priority. I feel free, in the context of the Conference title, to speak of population control because much of the problem might be solved by products of contemporary biomedical research and biotechnology. There is, of course, the eternal problem of people in impoverished agricultural areas desiring to have large families, particularly males with a liking for digging in the field. We might need entirely new answers to world food production and distribution.

I hasten to assure you that my lecture in October will not be based solely on the somber remarks above. I do intend to make some survey of the state of the art in biomedical research. I find it impossible, however, to consider the subject without being drawn in to the areas of behavior, tradition, habit and such items as national greed and cultural antagonism.

I look forward to the next round of letters from you and my fellow speakers.

Best regards,

Sincerely,

Christian B. Anfinsen

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